

Decreasing Latency for Improving Bandwidth in a Network

Prathmesh P. Wandhare ¹, Anshul N. Waghmare ², Sagar K.Patil³

^{1 2 3} Department of Computer Engineering, Rajiv Gandhi Institute of Technology, Mumbai, Maharashtra, India

Abstract - A second delay in communication can cause crores of loss for the company. Faster communication is needed for user satisfaction. Faster sites lead to better user engagement, better user retention, and higher conversions. This communication depends on the network performance. The two critical components that dictate the performance of all network traffic are latency and bandwidth. In this paper, we focus on increasing bandwidth while decreasing latency so that faster communication between networks takes place. We have combined different adapters such as Ethernet and Wi-Fi to make it a single logical link that will result in increasing bandwidth and thus decreasing latency further. This result in better transmission rate as well as a faster communication establishes in the network. In addition, helps to solve problem of managing large traffic of the network thus improves network congestion control.

Key Words: Bandwidth, Latency, Network Congestion, Link aggregation, Channel Bonding; Dispatch Proxy, Netcut.

1. INTRODUCTION

One of the most misunderstood concepts in networking is speed and capacity. Many people believe that speed and capacity is the same thing. When you hear someone, say "My Internet speed is 30 Mbps" or something similar, what they are actually referring to is the bandwidth capacity of their Internet service, not the speed. The speed of a network is actually the result of bandwidth and latency.

1.1 BANDWIDTH

Bandwidth refers to how wide the data pipe is, not how fast the data is transferred. The transfer rate is measured in latency. Moreover, latency means "delay." Therefore, speed and bandwidth work together. Wider the pipe is, less is the delay experience when loading webpages and transferring files. This is one reason you do not want people using your Wi-Fi without your knowledge. People who hack your Wi-Fi for just free Internet also consume your bandwidth. In some cases, this can become very costly.

1.2 LATENCY

Latency, on the other hand, is the amount of time it takes a data packet to travel from point A to point B. Together, bandwidth and latency define the speed and capacity of a network. Latency is usually expressed in milliseconds and can be measured using a ping command from your computer. When you run a ping command, a small packet of data (usually 32 bytes), is sent to another machine whereby the round-trip-time is measured in milliseconds. The ping

command measures how long it takes the data packet to leave the source computer travel to the destination computer, and return to the source computer.

2. PROBLEM DEFINITION

When there are multiple users connected in a network and due to one user, network congestion occurs. This result in drop in network efficiency and the other users does not get the internet services. So in order to efficiently manage such a trafficked network further solution have been implemented.

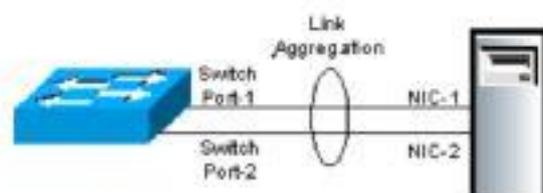
3. METHODOLOGY

3.1 COMBINATION (COMBINING MULTIPLE CONNECTIONS)

Network congestion is the result of an Internet route becoming too full. When there are too many requests over a specific network route, there is a backup of data packets. When too many data packets try to move through a specific network route, the result is network congestion. In simple terms, think about network congestion like highway traffic. If you drive along a highway that is merging from two lanes into one, a traffic jam will occur. The cause is trying to fit more cars into a lane than it can handle. The same situation occurs on the Internet. To many requests for data over the same Internet route causes congestion.

3.1.2 LINK AGGREGATION

The term link aggregation applies to various methods of combining (aggregating) multiple network connections in parallel in order to increase throughput beyond what a single connection could sustain, and to provide redundancy in case one of the links should fail. A Link Aggregation Group (LAG) combines a number of physical ports together to make a single high-bandwidth data path, so as to implement the traffic load sharing among the member ports in the group and to enhance the connection reliability.



Link aggregation addresses two problems with Ethernet connections: bandwidth limitations and lack of resilience. With regard to the first issue: bandwidth requirements do

not scale linearly. Ethernet bandwidths historically have increased tenfold each generation: 10 megabit/s, 100 Mbit/s, 1000 Mbit/s, 10,000 Mbit/s. If one started to bump into bandwidth ceilings, then the only option was to move to the next generation which could be cost prohibitive. An alternative solution, introduced by many of the network manufacturers in the early 1990s, is to combine two physical Ethernet links into one logical link via channel bonding. Most of these solutions required manual configuration and identical equipment on both sides of the aggregation.

The second problem involves the three single points of failure in a typical port-cable-port connection. In either the usual computer-to-switch or in a switch-to-switch configuration, the cable itself or either of the ports the cable is plugged into can fail. Multiple physical connections can be made, but many of the higher level protocols were not designed to fail over completely seamlessly.

3.1.2 Channel Bonding

Channel bonding is an arrangement of communications links in which two or more links are combined for redundancy or increased throughput. Examples include links associated with network interfaces on a host computer, or downstream and upstream channels within a DOCSIS cable modem connection. Channel bonding is differentiated from load balancing in that load balancing divides traffic between network interfaces on per network socket (OSI model layer basis, while channel bonding implies a division of traffic between physical interfaces at a lower level, either per packet (OSI model Layer 3) or a data link (OSI model Layer basis).

Channel bonding can be done with the help of router which is enabled with or have the feature of NIC teaming or NIC bonding (means combining two incoming network adapters). But problem here arises is that the cost of such routers are quite high and can only be affordable by big enterprises. Being costly is simply another disadvantage.

Another way of doing NIC teaming is using Windows 10 Pro edition which is used by business enterprises but the problem is this needs licensing and also this will increase the cost further. So, guess what we are left with? Yes, the third party softwares. Again there are many softwares like connectify, speedify which are paid ones, of course these will allow you to use it as a trail for some days but after that money game starts. So is there any option left? Yes, the software which is opensource. The only one tool which can perform NIC teaming as well as can be a proxy server too is dispatch proxy. This is an opensource tool which can be used to combine variety of connections whether it be multiple Ethernet or Wi-Fi or combination of both and after combining this increased bandwidth, can be further given to users.

3.1.3 Dispatch Proxy

We all have one common problem with the internet i.e., a good speed to access internet for downloading and

uploading data. We are surrounded by multiple internet connections like Wi-Fi, mobile hotspot (4G connections) and Ethernet. We can improve speed of internet by using multiple internet connections and combining all into one. For example, if you have two internet connections each of 1Mbps, then after combining you will get 2Mbps speed of internet. This can be achieved by using Dispatch Proxy. Dispatch proxy allows user to use multiple connections all at once. Dispatch Proxy contains Node.JS Development at the backend. The Dispatch proxy combines all available internet connections and create one proxy server. After creating proxy server, all the users connected in that network must do some changes in their system like changing the proxy setting and setting SOCKS IP which will be provided after creating proxy server.

Working of Dispatch proxy:

1. Check for available internet connections
2. Get their IP addresses by running this command "dispatch list "
3. Combine all connections by running this command:

Dispatch start <ipaddress1@1> <ipaddress2@1> 4. Set the proxy in browser

3.2 SPEED DIVISION

After combining all internet connections next phase is to divide and limit bandwidth speed. For example, if the max. Speed of the internet is 4Mbps and there are 3 users connected in a network, then 2 users can have 1Mbps and 1 can have 2Mbps speed.

We are using Netcut, a tool designed by arcai.com that manages network. Netcut enables a network admin to track and then manipulate the internet connections of all connected devices in a network. Using this, a network admin can see who is connected to a network; find MAC address of all connected devices, turn devices On/Off and even control bandwidth usage. We are dividing and controlling the bandwidth so that all users get their requested services from the server.

4. IMPLEMENTATION



Fig.1

We took two interfaces one which is wireless USB adapter (from the access point) and another which is Wi-Fi (from the mobile hotspot). These interfaces are combined in a computer with the use of dispatch-proxy tool. Combination of both the links means aggregation of links, after this, these links act as a single logical link. Dispatch-proxy acts as combiner and proxy server as well. This single logical link results in combination of bandwidth and the resultant bandwidth will be the addition of the two connections. This dispatch proxy is implemented in wireless pc; this will act as combiner as well as internet provider. This proxy server acts as an intermediary for requests from clients (users) seeking resources from other servers. A client (user) connects to the proxy server, requesting some service, such as a connection, web page, or other resource available from a different server and the proxy server evaluates these requests.

Providing bandwidth to further users also comes with a challenge if there is any need for particular client or user with higher bandwidth. This can overcome with the use of Netcut software that is installed in the proxy server's pc. By using this, we can control the bandwidth that is given to the users and deny it to a user. If we want to give special privilege to specific users by providing them with constant high bandwidth, that too we can do by using Netcut.

5. RESULT



Fig -2



Fig -3

The result obtained from our implementation is presented in this section. The combination of wireless USB adapter (Wi-Fi and Wi-Fi 1 which is provided by the hotspot of mobile results in high throughput. Fig. 4 clearly shows that both the Adapters are in working mode. Wi-Fi 1 with 392 kbps and Wi-Fi 2 with 1.2 Mbps combine to form a resultant of 1.58 Mbps. Different scenario can be found out when we use load balancing method where the adapters are being switched depending on the availability of the larger bandwidth associated with network adapters. Combining of connections i.e. link aggregation and load balancing are two different approach of managing network traffic. Result shows that combining connections actually increases bandwidth that is quite effective in terms of managing traffic because it allows quality and effective performance of the channel. Larger the bandwidth means higher amount of data transfer speed.

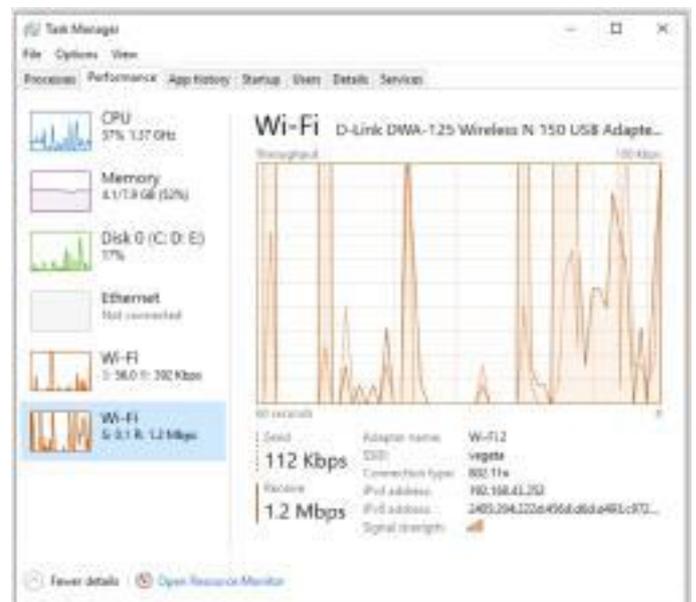


Fig -4

It should be kept in mind that this combination happens in proxy server and the combined speed is still maintained while we provide bandwidth to clients or users. Windows comes handy while doing the combination process as it provides hotspot and can connect to Wi-Fi at the same time. On the other hand, in Linux interfaces act as either Wi-Fi or hotspot. Although there may be further configuration to avail both Wi-Fi and hotspot interface at the same time but use of windows simply becomes less complex.

Further, this combined speed can be divided as per the need of the user and some users, if needed, can be blocked by using Netcut.

[8] MOHAMMAD R AJJULLAH Department of Computer Science, Karlstad University, Sweden, 2015

3. CONCLUSIONS

This paper presents a work on the two major components of Network i.e. bandwidth and latency since they majorly effect the communication channel. The internet industries need a faster, quality interaction between users and themselves to provide better services, efficient performance. It was shown in the paper that a powerful approach like link aggregation could make a difference in the size of the bandwidth. This link aggregation is a recent technique that is used by large enterprises but to make it available to the normal users was our ultimatum goal. Cost effectiveness is also another parameter that we consider in our implementation.

Everyone in the world want to access websites, data etc. without any delay as well as without any failure of the accessing server. Making such things possible is quite tough because of the increasing demands of the online industry.

Increasing demand similarly increases the network traffic that needs to be efficiently manage. The quality and output of the network decreases due to ineffective utilization of the bandwidth. Latency plays a vital role in doing this. Recently focus is on cloud storage since it is found out that in coming years this will be the essential part of every big company in the world. While such indications and automation of industries there comes a need for proper quality communication. This comes with lot of challenges and we have given one effective way of solving such complexity.

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